User's Manual

LS Programmable Logic Controller

MASTER-K S Series

MASTER-K10S

MASTER-K30S

MASTER-K60S

Installation Environment

1. Please avoid installing the PLC at following locations where;

- Temperature may experience ambient drops or rising.
  (It should stay within 0°C to 55°C (32°F ~ 131°F))
- condensation may occur due to abrupt temperature changes.
- vibration and shock are directly transmitted to the PLC.
- the PLC is exposed to the direct rays of the sun.
- the PLC is exposed to corrosive or inflammable gas.
- the PLC is exposed to conductive powder.

2. Please install the PLC at least 50mm away from a duct or other devices.

3. Be sure to install the PLC in the control cabinet that comply with IP54 or higher.

4. Be sure to place the PLC in the manufacturer's original packing while shipping or storing.

Warranty

- LSIS provides an 18 months warranty from the date of production.
- For troubles within the warranty period, LSIS will replace the entire PLC or repair the troubled parts free of charge except the following cases.
  1. the troubles caused by improper treatments or operations.
  2. the troubles caused by external devices.
  3. the troubles caused by remodeling or repairing based on user's own discretion.
  4. the troubles caused by nature disaster.
- This warranty is limited to the PLC itself only. It is not valid for the whole system which the PLC is attached.

■ Characteristics

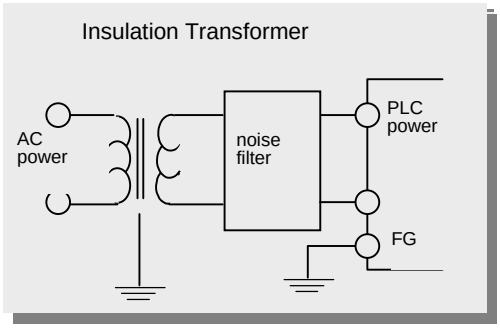
- You can choose the most applicable to your system according to the numbers of I/O points. (Max. I/O points : K10S – 24pts, K30S – 48pts, K60S – 88pts)
- The user program is stored in a EEPROM, and no battery back-up is required.
- The data communication through RS-232C / RS-485 is available.
- The real time clock function is provided (optional), which makes the scheduled program available.
- MK-S series includes a high speed counter, and they are applicable for a simple positioning system.

  K10S : 1-phase HSC is included in the base module.

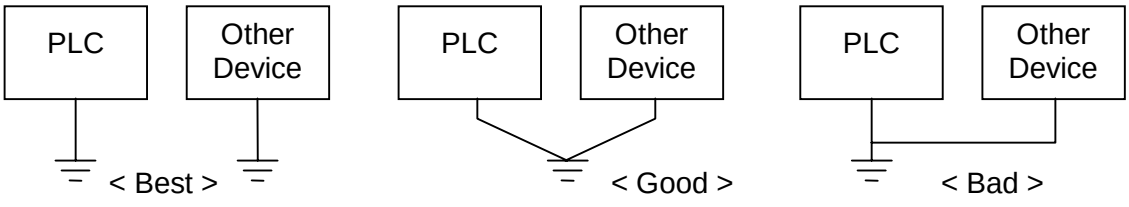
  K30S-A/K60S-A : 2-phase HSC is included in the base module.
- Analog I/O module (K56E-ADA) is available for K30S-A / K60S-A type only.
- Option module (K56E-OPT) and expansion module (K16E-xxS) can be used with K30S and K60S in common.

■ Power supplying to the PLC

- To prevent the PLC from an improper operation caused by the external noise, place a insulation transformer and/or a noise filter as shown in the right figure.



- Always install AC power cable and signal or data lines in separate ducts or bunches.
- The fuse in the DC power supply models, will be blown when the DC power is supplied in reverse polarity.
- Be careful to connect power source cable to the correct terminal. Internal device of PLC may be damaged by the improper lead connections.
- Supplying power beyond rated voltage / frequency may damaged internal devices of PLC.
- Grounding



■ Specifications

• General Specifications

Power Supplies	K10S : 100 ~ 240VAC(10.3W), 19~30VDC(5.5W)		
(47~63Hz)	K30S : 100 ~ 240VAC(14.7W), 10.5~28VDC(5.5W)		
	K60S : 110 / 240VAC(19.6W), 10.5~28VDC(5.5W)		
Dropout tolerance	1 / 2 cycle		
24VDC supply output	K10S : 0.2A	K30S : 0.3A	K60S : 0.7A
Withstanding voltage	500VDC, 10MΩ		
Grounding	Class 3 (Ground resistance ≤ 100Ω)		
Noise immunity	1,800V, 1μs (Noise simulator)		
Vibration	IEC 68-2-6, test Fc		
Shock	IEC 68-2-27		
Operation temperature	0 ~ 55 °C (32 ~ 131°F)		
Storage temperature	-25 ~ 70 °C (-13 ~ 158°F)		
Humidity	10 ~ 90% (Non condensing, RH-2)		
Atmosphere	Free from corrosive gas		
Pollution degree	Level 2		
ESD severity level	Level ESD-3 (IEC 1131-2)		
Altitude	2,000m (6,560 ft) or less		

Caution

When you supply power to external 24VDC devices from the power unit of MK-S series, be careful not to exceed the maximum capacity of power unit.

(No. of inputs simultaneously ON × 7mA)
+ (No. of outputs simultaneously ON × 8mA)
+ (Total current consumption of external 24VDC devices)

<

The maximum capacity of 24VDC output of power supply

Note : The maximum capacity of 24VDC output

K10S : 200mA K30S : 300mA K60S : 400mA

- **Performance specifications**

Program control method	Cyclic execution of stored program
I/O processing method	Updated after each scan
Instructions	30 basic instructions / 154 application instructions
Execution time	1.2μsec/step
Program capacity	2k steps (2,048 steps)
Memory device type	User program, parameter : EEPROM (8k byte)
	Data : S-RAM (64k byte)
Memory device range	P : I/O relay : P000 ~ P05F (96 points)
	K10S : P000 ~ P019 K30S : P000 ~ P02F
	K60S : P000 ~ P05F
	M : Auxiliary relay : M000 ~ M31F (512 points)
	K : Keep relay / K000 ~ K15F (256 points)
	L : Link relay / L000 ~ L15F (256 points)
	F : Special relay / F000 ~ F15F (256 points)
	T : 100ms timer / T000 ~ T095 (96 points)
	10ms timer / T096 ~ T127 (32 points)
	C : Counter relay / C000 ~ C127 (128 points)
	D : Word(16 bits) data register
	D000 ~ D255 (256 words)
	S : Step controller / S00.00 ~ S31.99 (32 ×100 steps)
Counter type	Up-counter, Down-counter, Up/Down-counter
	Ring-counter (Counting range : 0 ~ 65535)
Timer type	On-delay timer, Off-delay timer, Integrating timer
	Monostable timer, Retriggerable timer
	(Preset value setting range : 0 ~ 65535)
High speed counter	K10S : 1point, 1-phase, Max. 8kpps
	K30S-A / K60S-A : 1point, 2-phase
	Max. 8kpps(1-phase), Max. 2kpps(2-phase)
Other functions	Real time clock
	(Year, month, date, hour, minute, second, day)
	RS-232C, RS-485 communication
Memory back-up	User program, parameter : No back-up is required
	Data (retentive area) : Over 1000 hours (under 25°C)
	(back-up by super capacitor)

■ I/O specifications

- **K10S**

Item	I/O	Input	Output		
	Type	DC	Relay	TR(NPN)	TR(PNP)
Rated voltage		24VDC	24VDC/220VAC	24VDC	24VDC
Type		Type 2	Not protected		
Turn on voltage		≥ 15VDC	-	-	-
Turn off voltage		≤ 6VDC	-	-	-
Input current		7±2mA / Pt	-	-	-
Max. output current		-	2A/Pt, 3A/COM	1A/Pt, 3A/COM	1A/Pt, 3A/COM
Polarity		None	-	-	-
Switching device		-	Relay	TR	TR
On state voltage drop		-	-	≤ 1.5V	≤ 1.5V
Leakage current		-	-	≤ 0.1mA	≤ 0.1mA
Off→On response time		≤ 5ms	≤ 10ms	≤ 1ms	≤ 1ms
On→Off response time		≤ 7ms	≤ 10ms	≤ 1ms	≤ 1ms
I/O status indication		LED (yellow)	LED (red)		
Withstand voltage		1500VAC, 1 minute			
Noise immunity		1500Vpp, 1μs (Noise simulator)			

Note)

- The expected life span of relay

  The relay used in MASTER-K S series is FUJI RB105-E or TAKAMISAWA JY24H-K, and the manufacturer guarantees 10 million times (mechanical) and 0.1 ~ 3 million times (electrical) operation.

  The durability of relay depends on the type of external load. Therefore, we highly recommend customers to connect an external relay or SSR between PLC and large inductive load for improved reliability and maintenance of PLC.

  The capacity of external relay or SSR should be at least twice larger than the capacity of the load.
- All outputs will be turned off when interruptions of CPU control, power drops/interruptions, and/or power on/off occur.
- Improper terminal connection or overloads on I/O may cause a damage on the internal devices of PLC.
- The PLC will stop operating and show error message in case of inserting / withdrawing a module (expansion, option unit) while PLC is on.

- **K30S-A**

Item	I/O	Input		Output	
	Type	DC	AC	Relay	TR(NPN)
Rated voltage		24VDC*1)	220VAC	24VDC/220VAC	24VDC
Type		Type 2	Type 1	Not protected	
Turn on voltage		≥ 15VDC	≥ 150VAC	-	-
Turn off voltage		≤ 6VDC	≤ 50VAC	-	-
Input current		7±2mA/Pt*2)	11mA / Pt	-	-
Max. output current		-	-	2A/Pt, 3A/COM	1A/Pt, 3A/COM
Polarity		None	-	-	-
Switching device			Relay	Relay	TR
On state voltage drop		-	-	-	1.5V or less
Leakage current		-	-	-	0.1mA or less
Off→On response time		≤ 5ms*3)	≤ 15ms	≤ 10ms	≤ 1ms
On→Off response time		≤ 7ms*4)	≤ 15ms	≤ 10ms	≤ 1ms
I/O status indication		LED (Green)		LED (Red)	
Withstand voltage		1500VAC, 1 minute			
Noise immunity		2000Vpp, 1μs (Noise simulator)			

- **K60S-A**

Item	I/O	Input		Output	
	Type	DC	AC	Relay	TR(NPN)
Rated voltage		24VDC*1)	220VAC	24VDC/220VAC	24VDC
Type		Type 2	Type 1	Not protected	
Turn on voltage		≥ 15VDC	≥ 150VAC	-	-
Turn off voltage		≤ 6VDC	≤ 50VAC	-	-
Input current		7±2mA/Pt*2)	11mA / Pt	-	-
Max. output current		-	-	2A/Pt, 3A/COM	1A/Pt, 3A/COM
Polarity		None	-	-	-
Switching device			Relay	Relay	TR
On state voltage drop		-	-	-	1.5V or less
Leakage current		-	-	-	0.1mA or less
Off→On response time		≤ 5ms*3)	≤ 15ms	≤ 10ms	≤ 1ms
On→Off response time		≤ 7ms*4)	≤ 15ms	≤ 10ms	≤ 1ms
I/O status indication		LED (Green)		LED (Red)	
Withstand voltage		1500VAC, 1 minute			
Noise immunity		2000Vpp, 1μs (Noise simulator)			

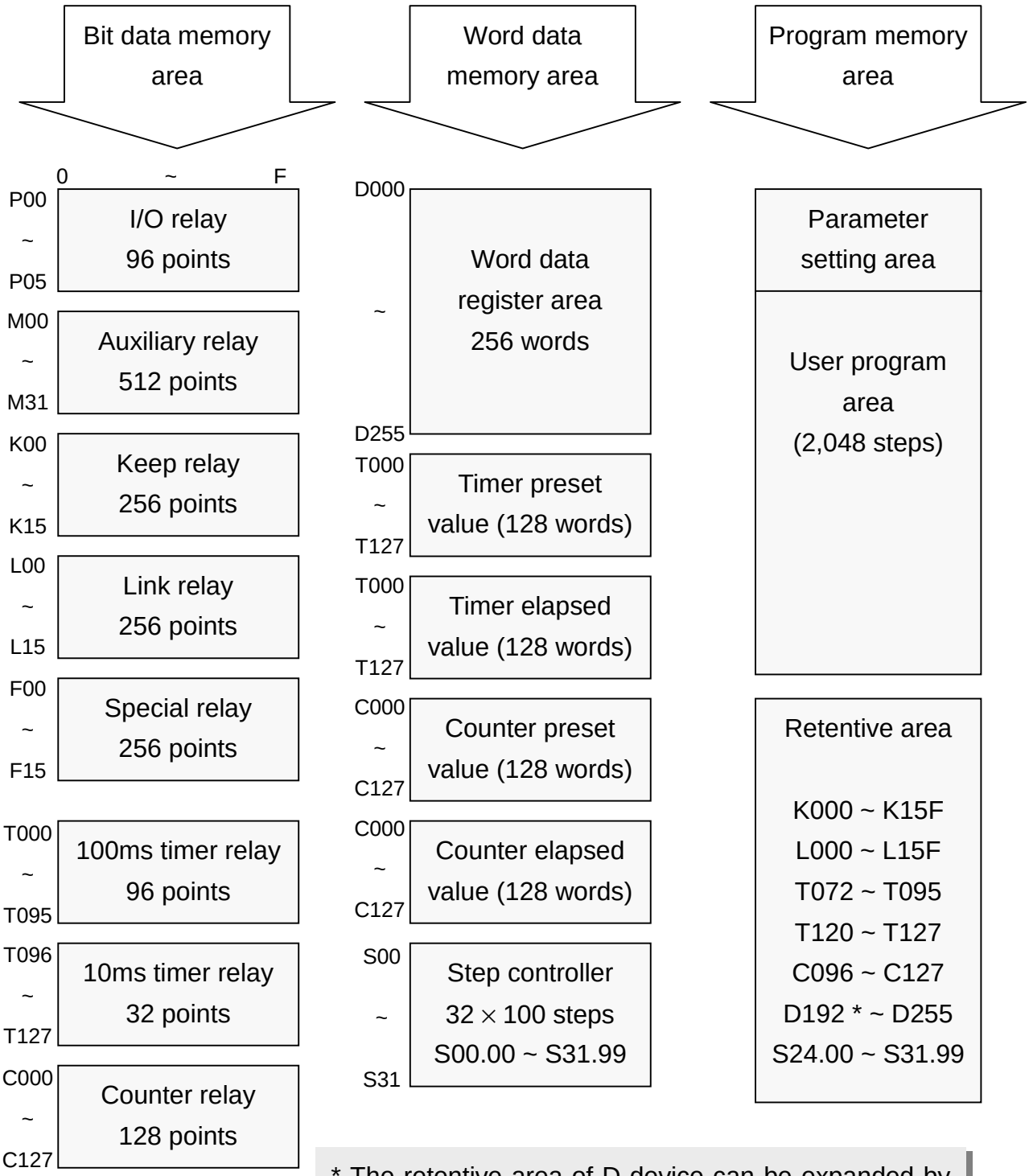
*1) DC power models : 12 ~ 24VDC

*2) P000, P001, and P002 of K30S-A and K60S-A are used for normal DC input and high speed counter. The input current of those three inputs is 16±2mA/point.

*3) P000, P001, and P002 : 0.3msec

*4) P000, P001, and P002 : 0.5msec

■ Memory map



* The retentive area of D device can be expanded by changing the start word of retentive area. This function is available with the PLC O/S version 1.7(K10S) or 3.2(K30S/60S). See page 21 for details

■ RTC(Real Time Clock) function

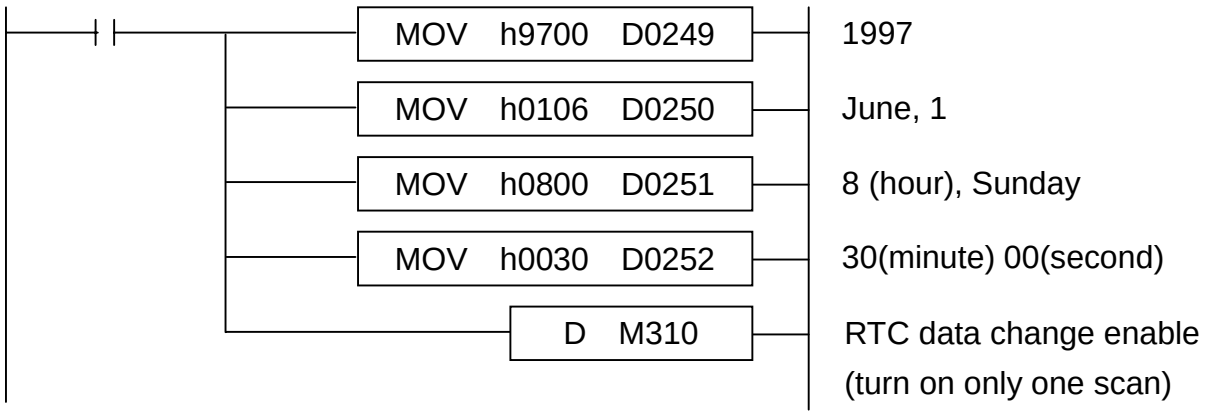
1. The memory area of RTC data

	Memory area		Data setting range
	Current	Preset	
Second	L158 ~ L15F	D252_H (upper byte)	00 ~ 59
Minute	L150 ~ L157	D252_L (lower byte)	00 ~ 59
Hour	L148 ~ L14F	D251_H (upper byte)	00 ~ 23
Day	L140 ~ L147	D251_L (lower byte)	0 ~ 6*
Date	L138 ~ L13F	D250_H (upper byte)	1 ~ 31
Month	L130 ~ L137	D250_L (lower byte)	1 ~ 12
Year	L128 ~ L12F	D249_H (upper byte)	00 ~ 99

Note) 0 = Sunday 1 = Monday 2 = Tuesday 3 = Wednesday
4 = Thursday 5 = Friday 6 = Saturday

2. Changing RTC data
   1) Put the new RTC data to the RTC preset data area (D249 ~ D252).
   2) Turns on the RTC data change enable relay (M310). Then the current RTC data (L12 ~ L15) is replaced with the new data. After the RTC data is updated, the M310 should be turned off immediately because the current RTC data will be updated as preset data at every scan while the M310 is on.

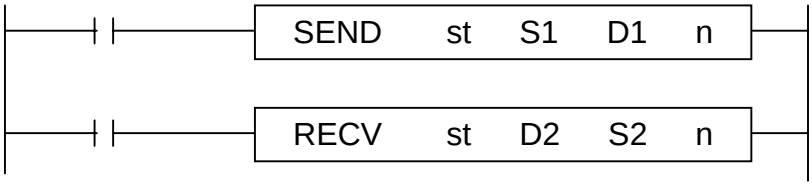
3. The example of RTC data changing program.
   (New RTC data : 1997, June 1, SUN 08 : 30 : 00)



■ RS-485 Communication functions

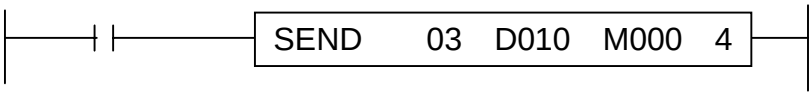
1. General specification
   - Instruction for RS-485 communication : SEND(Fun 159), RECV(Fun 158)
   - Transmission method : Asynchronous, Half-duplex
   - Max. connection station : 32 stations (h00 ~ h1F), Master station = h1F
   - Transmission speed : 300 ~ 19,200bps (Selectable)
   - Transmission distance : Max. 1km (no repeater)
   - Station number and speed setting : According to parameter setting

2. Instructions
   1) SEND (Fun159) : Transmit data from master PLC to slave PLC.
   2) RECV (Fun158) : Receive data from slave PLC to master PLC.
   3) Only master PLC (station number h1F) can use SEND / RECV instruction.

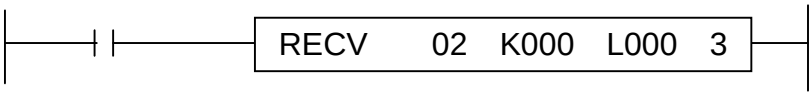


St : the station number of slave PLC
S1 : the start word of data block of master PLC to be transmitted to slave PLC.
D1 : the start word of data block of slave PLC that transmitted data is stored in.
S2 : the start word of data block of slave PLC to be transmitted to the master.
D2 : the start word of data block of master PLC that transmitted data is stored in.
n : the number of word data to be transmitted.

3. Example of programming
   1) Transmit the D010 ~ D013 (4 words) of master PLC to the M000 ~ M003 of slave PLC (station number h03).



   2) Read the L000 ~ L002 (3 words) of slave PLC (station number h02) and store the data to the K000 ~ K002 of the master PLC.



■ Additional function of K30S-A and K60S-A

K30S-A / K60S-A that the O/S version is v3.0 or later, have additional functions such as built-in 2-phase high speed counter and analog I/O unit.

1. The product list of A-type

Type	Product name	Additional function		Remarks
		Analog I/O	2-phase HSC	
K30S-A	K24PA-DRS	◎	◎	
	K24PA-DTS(N)	◎	◎	
	K24PA-ARS	◎	×	
	K24PA-DRS/DC	◎	◎	
	K24PA-DTS(N)/DC	◎	◎	
	K32PA-DRS	◎	◎	
	K32PA-DTS(N)	◎	◎	
	K32PA-ARS	◎	×	
	K32PA-DRS/DC	◎	◎	
	K32PA-DTS(N)/DC	◎	◎	
K60S-A	K56PA-DRS	◎	◎	
	K56PA-DTS(N)	◎	◎	
	K56PA-ARS	◎	×	
	K56PA-DRS1	◎	◎	
	K56PA-DTS1(N)	◎	◎	
	K56PA-ARS1	◎	×	
	K56PA-DRS/DC	◎	◎	
	K56PA-DTS(N)/DC	◎	◎	

2. The restriction regarding to HSC input.
   1) The HSC of option unit (K56E-OPT) can not be used with A-type models. Only built-in HSC can be used.
   2) The input terminals of built-in HSC are P000 ~ P002 and those input terminals are shared with DC input. The rated voltage of HSC is 24VDC, so the AC input models can not use high speed counter.
   3) DC power models : The rated input voltage of DC power of A-type is 12~24VDC (free voltage), and the DC input of DC power models also operates with 12 ~ 24VDC. However, the P000 ~ P002 is fixed as 24VDC input because the HSC input is fixed as 24VDC.
   4) Sensitivity of input : Because the P000, P001, and P002 is designed for high speed counter input, their response time is much shorter than other input terminals. (P000 ~ P002 : less than 0.5msec, Others : 5 ~ 7msec) Therefore, please be careful when use P000 ~P0002 for general input terminal.

3. 2-phase high speed counter

1) Performance specifications

	HSCNT (Fun 214)	HSC (Fun 215)
Points	1-phase, 1 point	1 or 2 phase, 1 point
Max. counting speed	8kpps	8kpps (1-phase) 2kpps (2-phase)
Input terminal	P000	P000, P001, P002
Counting range	0 ~ hFFFF (16 bits)	0 ~ hFFFFFFFF (32bits)
Flag	-	F071 (Carry flag) F072 (Borrow flag)
Elapsed value register	F14 word	F14 word (lower 16bits) F15 word (upper 16bits)
Preset value register	F15 word	-
Operation mode setting	-	D247

Note)

1. The operation mode setting of D247 will be ignored when the HSCNT instruction is used.
2. Refer the MASTER-K Programming manual for details of each instructions.

2) Mode selection (HSC instruction)

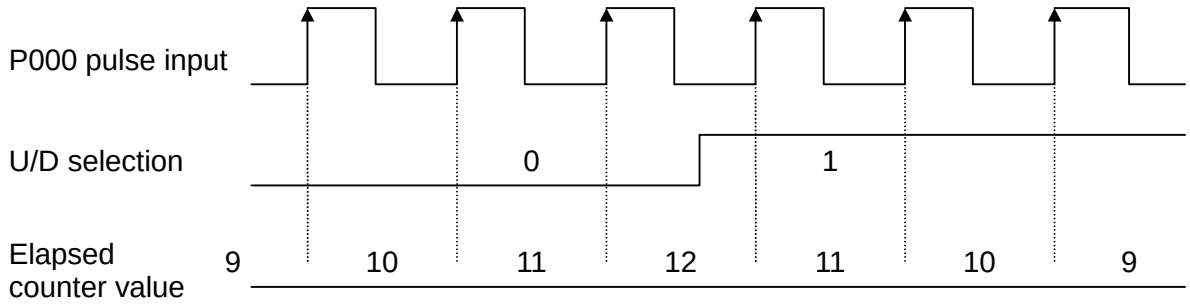
MODE	D247	Input terminal			Description
		P000	P001	P002	
1 phase input	h0110	Pulse input	Not used	Not used	U/D : Set by user program PR : Set by user program
	h0111	Pulse input	Not used	PR input	U/D : Set by user program PR : Set by P002 input
	h0120	Pulse input	U/D selection	Not used	U/D : Set by P001 input PR : Set by user program
	h0121	Pulse input	U/D selection	PR input	U/D : Set by P001 input PR : Set by P002 input
2 phase input	h0220	A-phase input	B-phase input	Not used	U/D : Automatically set by the difference A & B phase PR : Set by user program
	h0221	A-phase input	B-phase input	PR input	U/D : Automatically set by the difference A & B phase PR : Set by P002 input

Note) Even the U/D and/or PR is set by input terminal (P001, P002), the HSC instruction should be programmed with dummy input condition for U/D and/or PR. The dummy input of HSC instruction is ignored when the user program is executed.

3) Description of high speed counter operation

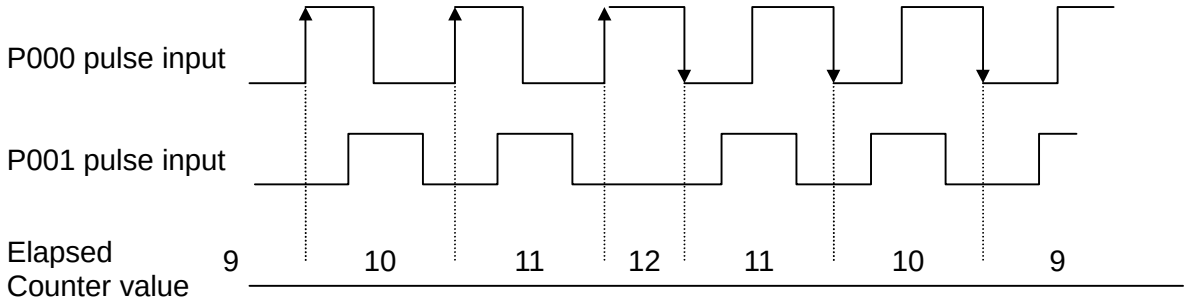
☐ 1-phase operation

- When EN input turns on, the high speed counter is enabled.
- Up/Down counting is executed with the rising edge of pulse input (P000). When the U/D input is 0, the high speed counter executes increment, and when the U/D is 1, it executes decrement.



☐ 2-phase operation

- When EN input turns on, the high speed counter is enabled.
- When the A-phase input leads the B-phase, the counter increase elapsed value with the rising edge of A-phase. When the B-phase leads A-phase, the elapsed value of high speed counter is decreased with the falling edge of A-phase.



☐ Output contact (F070)

This relay turns on while the elapsed value (F14,F15) of high speed counter is equal or greater than the setting value (SV) assigned with HSC instruction.

☐ Carry flag (F071)

When the elapsed value of high speed counter reaches hFFFFFFFF, the carry flag turns on and further increase inputs are ignored.

☐ Borrow flag (F072)

When the elapsed value of high speed counter reaches h00000000, the borrow flag turns on and further decrease inputs are ignored.

☐ PR input

With the rising edge of PR input, the elapsed value of high speed counter is replaced with preset value (PV) assigned with HSC instruction.

☐ Others

- When only A-phase pulse is active in the 2-phase mode;
  B-phase is low : the elapsed value repeats increase and decrease.
  B-phase is high : the elapsed value is not changed.
- When only B-phase pulse is active in the 2-phase mode;
  the elapsed value is not changed

4. Analog I/O module (K56E-ADA)

1) Performance specification

<table>
<tr><th colspan="2">Item</th><th colspan="3">Specifications</th></tr>
<tr><td rowspan="7">Analog input</td><td rowspan="2">Analog input</td><td>Voltage</td><td>0 ~ 5VDC
0 ~ 10VDC</td><td rowspan="2">Set by jumper setting</td></tr>
<tr><td>Current</td><td>DC 0 ~ 20 ☐</td></tr>
<tr><td>Resolution</td><td colspan="3">10 bits</td></tr>
<tr><td>Input selection (voltage/current)</td><td colspan="3">Select by terminal wiring.
(When current input is used, short the V and I terminal)</td></tr>
<tr><td>Channel</td><td colspan="3">2 channels / unit</td></tr>
<tr><td rowspan="2">Absolute input range</td><td>Voltage</td><td colspan="2">0 ~ +12VDC</td></tr>
<tr><td>Current</td><td colspan="2">DC 0 ~ +25 ☐</td></tr>
<tr><td rowspan="6">Analog output</td><td>Resolution</td><td colspan="3">10 bits</td></tr>
<tr><td rowspan="2">Analog output</td><td>Voltage</td><td colspan="2">0 ~ 10VDC
(external load resistance : 2 ☐ ~ 1 ☐)</td></tr>
<tr><td>Current</td><td colspan="2">DC 0~20 ☐
(external load resistance : 500☐or less)</td></tr>
<tr><td>Output selection</td><td colspan="3">Select by terminal wiring (voltage/current)</td></tr>
<tr><td>Channel</td><td colspan="3">1 channel / unit</td></tr>
<tr><td rowspan="2">Absolute input range</td><td>Voltage</td><td colspan="2">0 ~ +12VDC</td></tr>
<tr><td>Current</td><td colspan="2">DC 0 ~ +24 ☐</td></tr>
</table>

Max. resolution	0 ~ 5VDC	5 □ (1/1000)
	0 ~ 10VDC	10 □ (1/1000)
	DC 0 ~ 20 □	20 □ (1/1000)
Power supply	External 24VDC	
Overall accuracy	±0.5% of full scale	
Conversion time	1.5 msec / 1 unit	
Insulation	Photo coupler insulation between input terminal and power supply. (No insulation between channels)	
Terminal	12 points terminal block	
Current consumption	75 □ or less	

2) System configuration

The K56E-ADA unit can be used with K30S-A and K60S-A in common. It occupies 16 points of I/O channel, so there is a limitation when it connected with expansion unit.

K30S : Max. 1 unit (analog unit + expansion unit)

K60S : Max. 2 unit (analog unit + expansion unit)

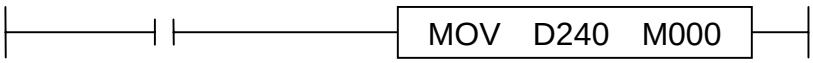
3) Data conversion area

	A/D channel 0	A/D channel 1	D/A channel 0
Analog unit 1	D240	D241	D242
Analog unit 2	D243	D244	D245

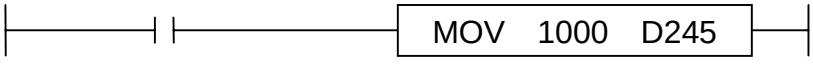
Note) The analog data conversion area is placed in the retentive area to keep the data when power on/off or mode change. To prevent mis-operation at the power-on, however, the D/A output data (D242, D245) is cleared as 0 at the power-on or mode change if the analog module is attached.

4) Example of programming

- Read the A/D channel 0 of unit 1 and store the converted data to M000

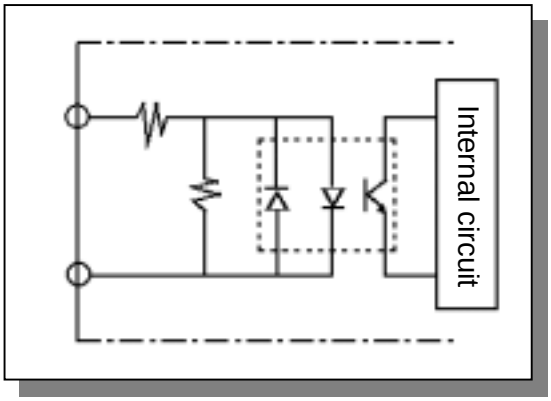


- Write 1000 to the D/A channel of the second analog unit (unit 2).

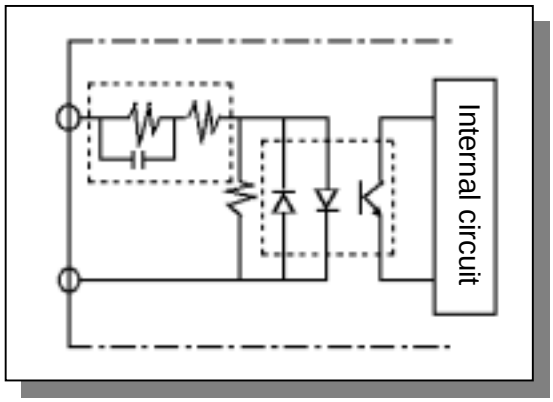


■ I/O circuit

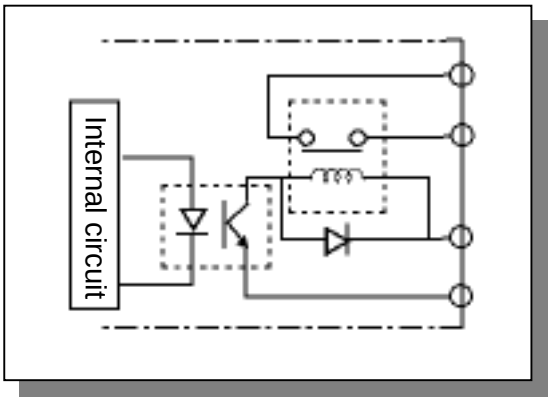
DC24V input



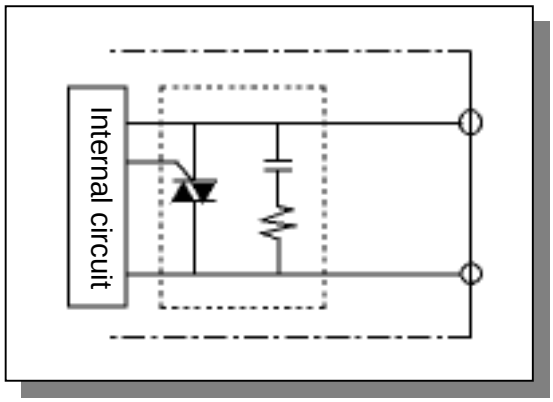
AC input



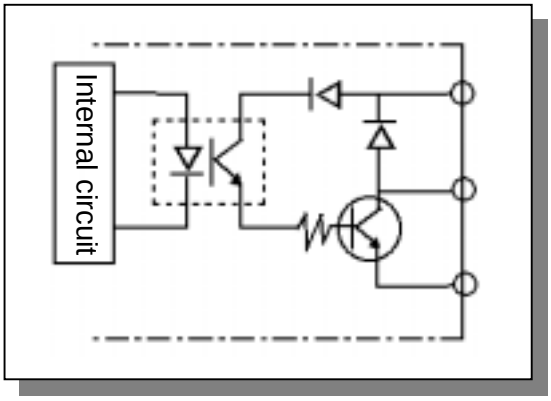
Relay output



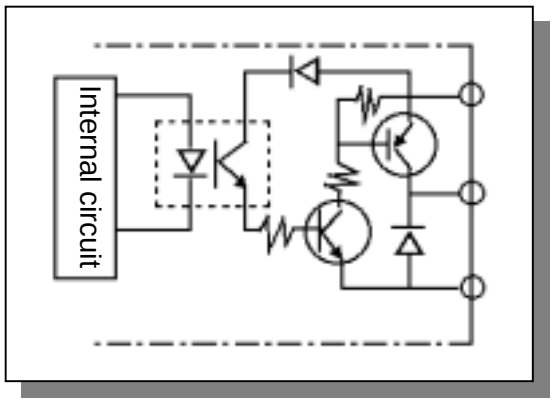
SSR output



Transistor (NPN) output

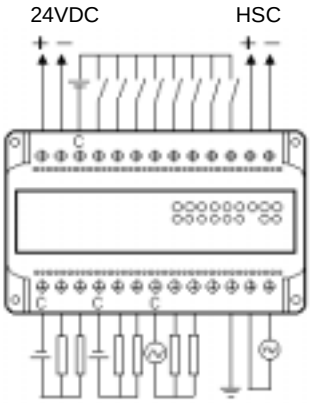
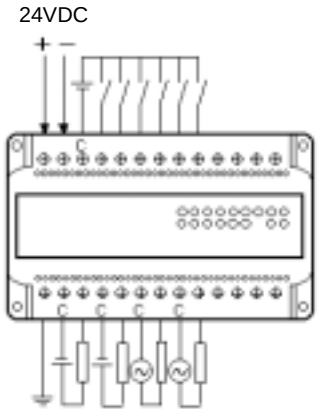
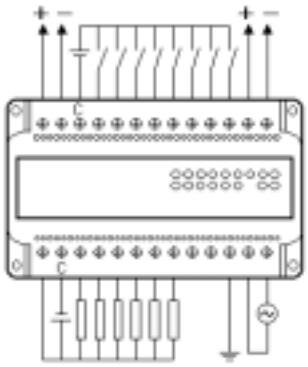
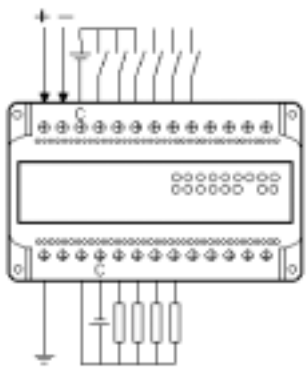
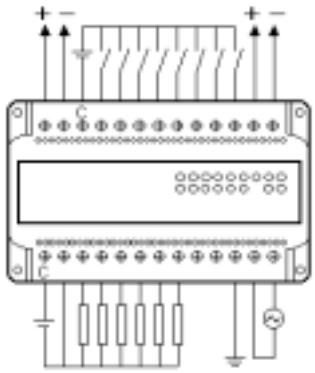
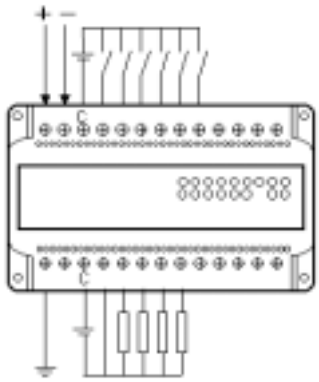


Transistor (PNP) output

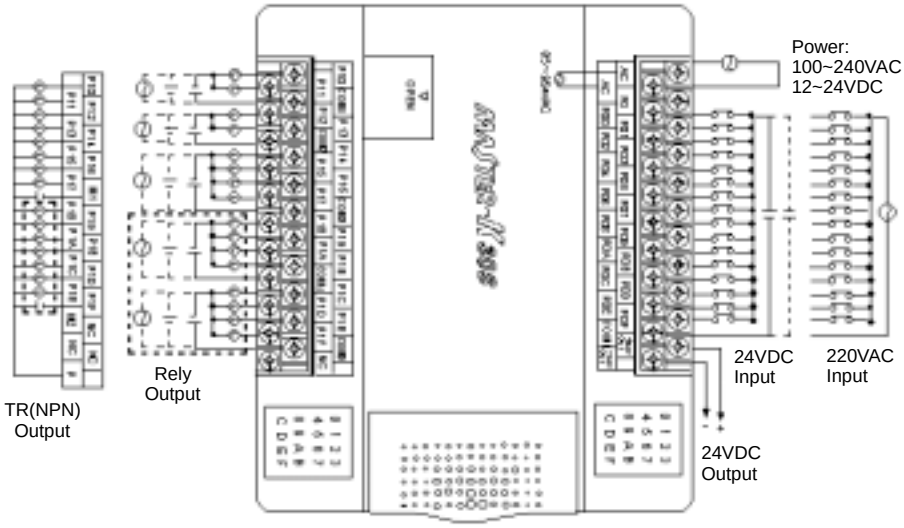


■ Wiring

- **K10S**

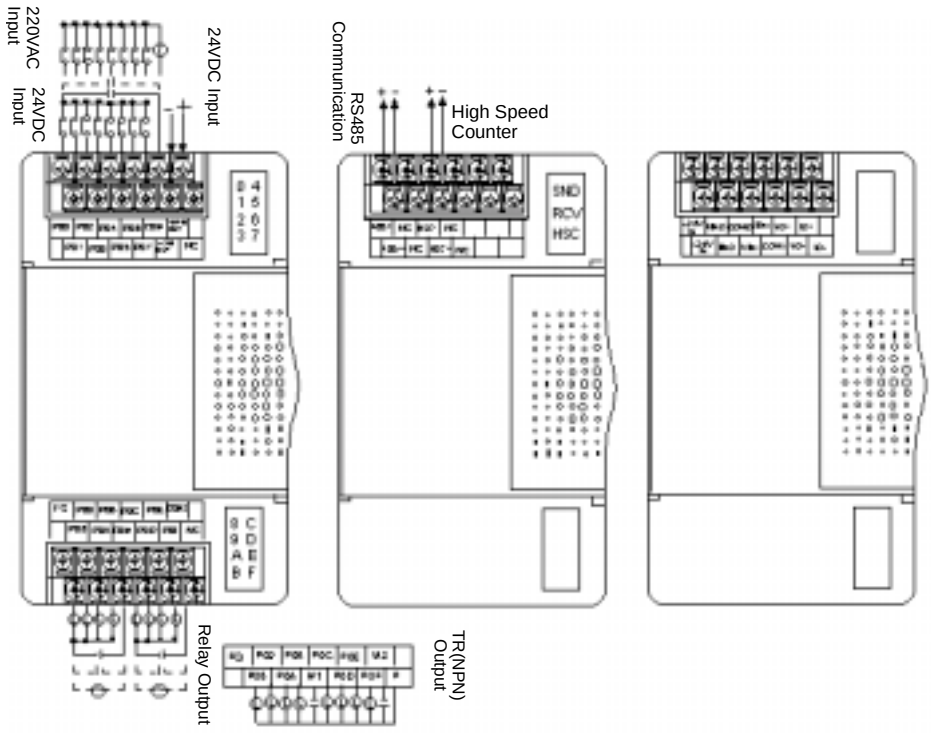
	Base Unit	Expansion Unit
DC input Relay output	24VDC HSC  Power : 100~240VAC 24VDC	24VDC 
DC input TR output (NPN)	24VDC HSC  Power : 100~240VAC 24VDC	24VDC 
DC input TR output (PNP)	24VDC HSC  Power : 100~240VAC 24VDC	24VDC 

- **K30S**



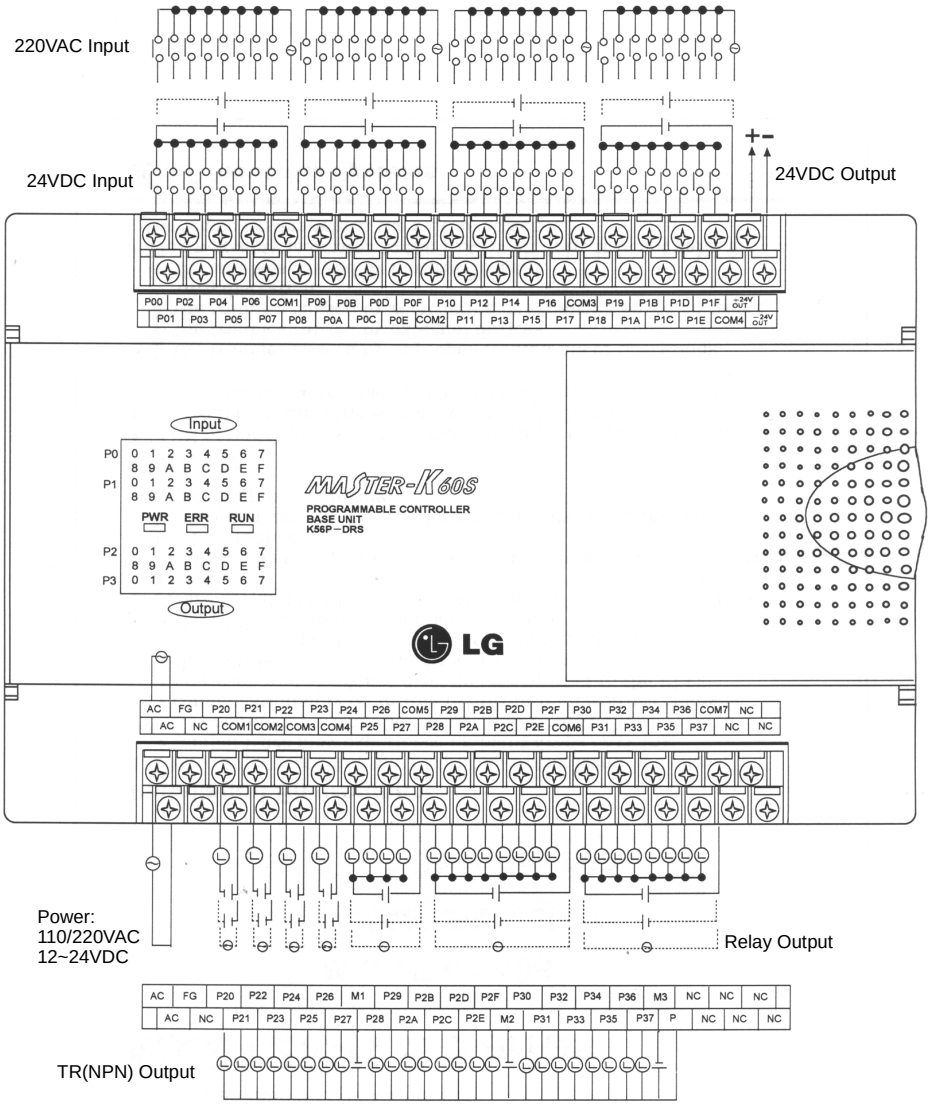
- **Expansion/Option Unit**

◆ Expansion Unit ◆ Option Unit ◆ Analog Unit



Note) The electrical ratings of power, input and output can be various according to the each models. Please see page 23~24 for the detailed electrical ratings of each models.

- **K60S**



Note) The assignment of I/O address when the expansion unit is used.

1) Expansion and analog I/O unit occupies 16 points of I/O address.
2) Option unit does not occupy I/O address
3) Examples

K30S : Base Unit (P000 ~ P01F) + Expansion (P020 ~ P02F)

K30S : Base Unit (P000 ~ P01F) + Option Unit + Expansion (P020 ~ P02F)

K60S : Base Unit (P000 ~ P037) + Expansion 1(P040 ~ P04F) + Expansion 2 (P050 ~ P05F)

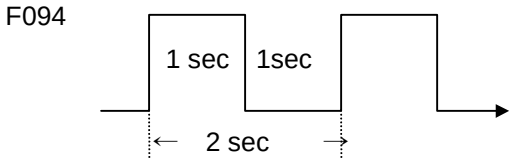
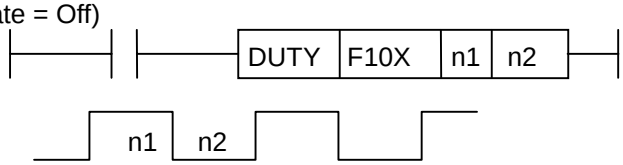
K60S : Base Unit (P000 ~ P037) + Analog Unit + Expansion 1 (P050 ~ P05F)

K60S : Base Unit (P000 ~ P037) + Option Unit + Expansion 1 (P040 ~ P04F) + Analog Unit

■ Memory devices for special usage

1. F relay

Relay	Name	Description	
F000	RUN flag	Set while PLC is on RUN mode	
F001	PGM flag	Set while PLC is on PGM mode	
F002	Pause flag	Set while PLC is on Pause mode	
F007	EPROM mode	Set when PLC is on EPROM run mode.	
F010	Always on	Used as a dummy relay or initialization in user programs	
F011	Always off		
F012	1 scan on	On during the first scan after PGM→RUN mode	
F013	1 scan off	Off during the first scan after PGM→RUN mode	
F014	Turnover per each scan	Repeat set/reset during PLC is on RUN mode	
F020 ~ F02F	Communication error information	• Related to SEND, RECV instructions only • Upper byte : The station No. where error occurred Lower byte : error code • The error code of time out error : h20 • No error : h000	
F030	H/W error	Set in case of internal ROM error, 24V fail error, I/O combination error	
F031	S/W error	Set in case of WDT error, program error, missing END/RET error	
F03A	RTC data error flag	Set when an error is detected in RTC data	
F040 ~ F045	I/O combination Error	Set in case of attachment / detachment of I/O unit during operation, or improper connection	
F050 ~ F05F	Error code	• h0000 : No error • h0023 : Code error • h0014 : I/O error • h0024 : Missing END error • h0021 : Parameter error • h0025 : Missing RET error	
F060 ~ F06F	The step No. where error occurred	• The step No. where program error occurred is stored • In case of branch instruction error, the destination step No. is stored.	
F070 ~ F077	HSC register	High speed counter area	
F080 ~ F08F	Station number and model of PLC	Upper byte : PLC station No. (h00 ~ h1F) Lower byte : PLC model	• K10S/K10S1 : hxx31 • K60S : hxx36 • K30S : hxx33

<table>
<tr><th>Relay</th><th>Name</th><th>Descriptions</th></tr>
<tr><td>F090</td><td>20 msec period clock</td><td rowspan="8">These relays repeat On/Off with fixed time interval, and are generated in RUN mode only.
 
</td></tr>
<tr><td>F091</td><td>100 msec period clock</td></tr>
<tr><td>F092</td><td>200 msec period clock</td></tr>
<tr><td>F093</td><td>1 sec period clock</td></tr>
<tr><td>F094</td><td>2 sec period clock</td></tr>
<tr><td>F095</td><td>10 sec period clock</td></tr>
<tr><td>F096</td><td>20 sec period clock</td></tr>
<tr><td>F097</td><td>1 minute period clock</td></tr>
<tr><td>F100
~ F107</td><td>User defined clock
F100 : Clock 0
~
F107 : Clock 7</td><td>These relays repeat On/Off based on a scan time. (Initial state = Off)
 
</td></tr>
<tr><td>F110</td><td>Arithmetic error flag</td><td>Set when an arithmetic error occurred during operation</td></tr>
<tr><td>F111</td><td>Zero flag</td><td>Set when the result value is zero</td></tr>
<tr><td>F112</td><td>Carry flag</td><td>Set when Carry or Borrow occurs as a result of operation</td></tr>
<tr><td>F11A</td><td>On sending flag</td><td rowspan="3">These relays indicate the communication status when DIN, DOUT instruction are used.</td></tr>
<tr><td>F11C</td><td>On receiving flag</td></tr>
<tr><td>F11E</td><td>Receive completion flag</td></tr>
<tr><td>F11F</td><td>Communication error flag</td><td>• DIN, DOUT : Set when time-out error occurred
• SEND, RECV : Set when time-out error occurs or NAK massage is detected.</td></tr>
<tr><td>F120</td><td><</td><td rowspan="6">These relays are set according to the result of compare instructions (CMP, CMPP, DCMP, DCMPP)</td></tr>
<tr><td>F121</td><td>≤</td></tr>
<tr><td>F122</td><td>=</td></tr>
<tr><td>F123</td><td>></td></tr>
<tr><td>F124</td><td>≥</td></tr>
<tr><td>F125</td><td>≠</td></tr>
<tr><td>F130
~ F135</td><td>I/O status</td><td>Each relays show whether relevant I/O modules are attached or not.</td></tr>
<tr><td>F140
~ F14F</td><td rowspan="2">HSC present / preset value</td><td>HSCNT: the present HSC count value is stored.
HSC: the lower word of present HSC count value is stored.</td></tr>
<tr><td>F150
~ F15F</td><td>HSCNT: the next preset value is stored.
HSC: the higher word of present HSC count value is stored.</td></tr>
</table>

2. Other devices

Area	Description		Remarks
M310	RTC data change enable		See page 8 for details
L12 ~ L15	RTC data		
D240	Analog unit # 1	A/D Ch.0 input data	K30S-A, K60S-A type only (O/S ver 3.0 or later)
D241		A/D Ch.1 input data	
D242		D/A output data	
D243	Analog unit # 2	A/D Ch.0 input data	
D244		A/D Ch.1 input data	
D245		D/A output data	
D246	Retentive area setting		K10S : O/S ver 1.7 or later K30S/60S : O/S ver 3.2 or later
D247	Operation mode setting of high speed counter		K30S-A, K60S-A type only (O/S ver 3.0 or later)
D248	Time out value of RS485 communication		O/S V1.5 or later
D249 ~ D252	User RTC data		O/S V1.3 or later Same format with L12 ~ L15
D253	Current scan time		Unit : msec
D254	Minimum scan time		
D255	Maximum scan time		

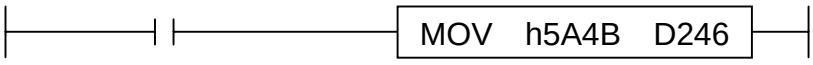
- **Retentive area setting**

1. This function is available when the O/S version is 1.7 (K10S) / 3.2 (K30S/60S) or later.
2. To change the retentive area, put the start address of D register to D246 according to the following format.

   Upper 8 bits : h5A (Retentive area setting enable code)

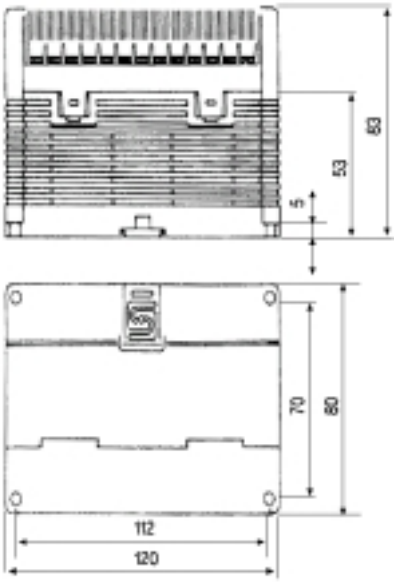
   Lower 8 bits : The hexadecimal value of start address
3. The available range of start value is 0 ~ 192 (h00 ~ hC0). When the start address is out of the range, or the upper byte is not ‘h5A’, the retentive area is set as the factory default value. (D192 ~ D255)
4. Only start address is adjustable, and end address (D255) can not be changed.
5. Example

   : Set the retentive area as D075 ~ D255

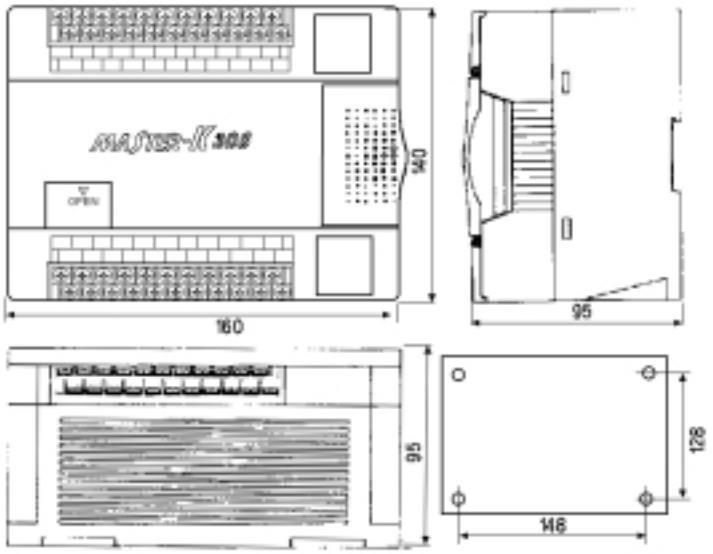


■ External Dimensions

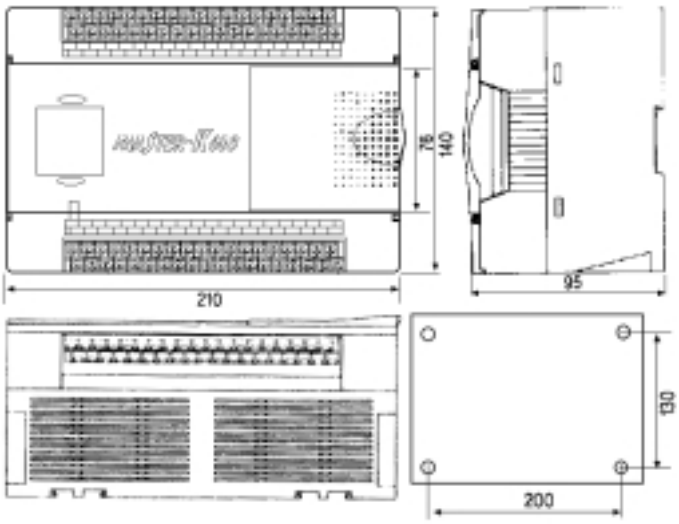
K10S



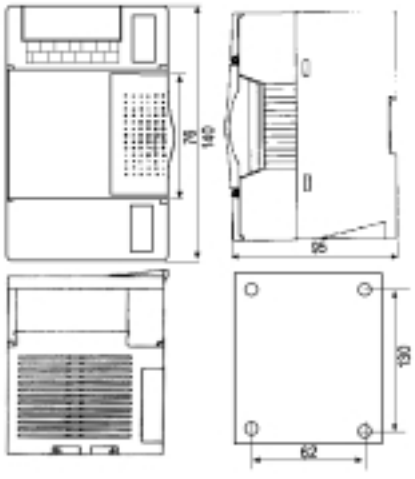
K30S



K60S



Expansion/Option/Analog Unit



■ Product list

K10S

No	Product name	Power	Input	Output	Note
1	K14P-DRS	AC100~240V	DC24V, 8 Pts	Relay, 6 Pts	
2	K14P-DRS/DC	DC24V	DC24V, 8 Pts	Relay, 6 Pts	
3	K14PC-DRS	AC100~240V	DC24V, 8 Pts	Relay, 6 Pts	RTC
4	K14PC-DRS/DC	DC24V	DC24V, 8 Pts	Relay, 6 Pts	RTC
5	K14P-DTS(N)	AC100~240V	DC24V, 8 Pts	TR, NPN, 6 Pts	
6	K14P-DTS(N)/DC	DC24V	DC24V, 8 Pts	TR, NPN, 6 Pts	
7	K14PC-DTS(N)	AC100~240V	DC24V, 8 Pts	TR, NPN, 6 Pts	RTC
8	K14PC-DTS(N)/DC	DC24V	DC24V, 8 Pts	TR, NPN, 6 Pts	RTC
9	K14P-DTS(P)	AC100~240V	DC24V, 8 Pts	TR, PNP, 6 Pts	
10	K14P-DTS(P)/DC	DC24V	DC24V, 8 Pts	TR, PNP, 6 Pts	
11	K14PC-DTS(P)	AC100~240V	DC24V, 8 Pts	TR, PNP, 6 Pts	RTC
12	K14PC-DTS(P)/DC	DC24V	DC24V, 8 Pts	TR, PNP, 6 Pts	RTC
13	K10E-DRS	-	DC24V, 6 Pts	Relay, 4 Pts	Expansion
14	K10E-DTS(N)	-	DC24V, 6 Pts	TR, NPN, 4 Pts	Expansion
15	K10E-DTS(P)	-	DC24V, 6 Pts	TR, PNP, 4 Pts	Expansion

K30S-A

No	Product name	Power	Input	Output	Note
1	K24PA-DRS	AC100~240V	DC24V, 16 Pts	Relay, 8 Pts	
2	K24PA-DRS/DC	DC12~24V	DC12~24V, 16 Pts	Relay, 8 Pts	
3	K24PA-ARS	AC100~240V	AC220V, 16 Pts	Relay, 8 Pts	No HSC
4	K24PA-DTS(N)	AC100~240V	DC24V, 16 Pts	TR, NPN, 8 Pts	
5	K24PA-DTS(N)/DC	DC12~24V	DC12~24V, 16 Pts	TR, NPN, 8 Pts	
6	K32PA-DRS	AC100~240V	DC24V, 16 Pts	Relay, 16 Pts	
7	K32PA-DRS/DC	DC12~24V	DC12~24V, 16 Pts	Relay, 16 Pts	
8	K32PA-ARS	AC100~240V	AC220V, 16 Pts	Relay, 16 Pts	No HSC
9	K32PA-DTS(N)	AC100~240V	DC24V, 16 Pts	TR, NPN, 16 Pts	
10	K32PA-DTS(N)/DC	DC12~24V	DC12~24V, 16 Pts	TR, NPN, 16 Pts	

K60S-A

No	Product name	Power	Input	Output	Note
1	K56PA-DRS	AC220V	DC24V, 32 Pts	Relay, 24 Pts	
2	K56PA-DRS1	AC110V	DC24V, 32 Pts	Relay, 24 Pts	
3	K56PA-DRS/DC	DC12~24V	DC12~24V, 32 Pts	Relay, 24 Pts	
4	K56PA-ARS	AC220V	AC220V, 32 Pts	Relay, 24 Pts	No HSC
5	K56PA-ARS1	AC110V	AC220V, 32 Pts	Relay, 24 Pts	No HSC
6	K56PA-DTS(N)	AC220V	DC24V, 32 Pts	TR, NPN, 24 Pts	
7	K56PA-DTS1(N)	AC110V	DC24V, 32 Pts	TR, NPN, 24 Pts	
8	K56PA-DTS(N)/DC	DC12~24V	DC12~24V, 32 Pts	TR, NPN, 24 Pts	

Expansion/Option/Analog for K30S/60S

No	Product name	Input	Output	Note
1	K16E-DRS	DC24V, 8 Pts	Relay, 8 Pts	
2	K16E-ARS	AC220V, 8 Pts	Relay, 8 Pts	
3	K16E-DTS(N)	DC24V, 8 Pts	TR, NPN, 8 Pts	
4	K56E-OPT	-	-	RTC, RS-485
5	K56E-ADA	DC0~5V / 0~10V or DC0 ~ 20mA 2ch	DC0 ~ 10V or DC0 ~ 20mA 1ch	

■ Other technical materials

- MASTER-K Programming manual
- Graphic Loader (KGL-WIN) user's manual
- Handy Loader (KLD-150S) user's manual
- MASTER-K / PMU communication technical materials

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